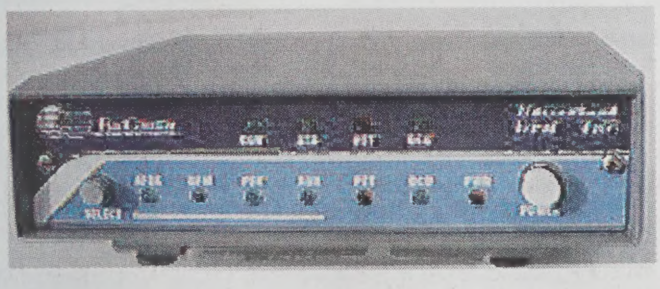
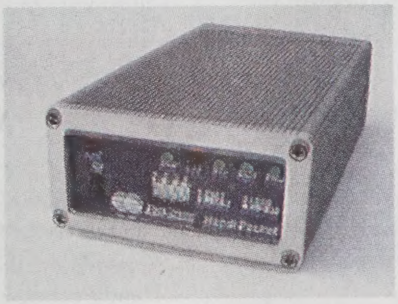
PacComm

- *Advanced Technology*
- *Enduring Value*

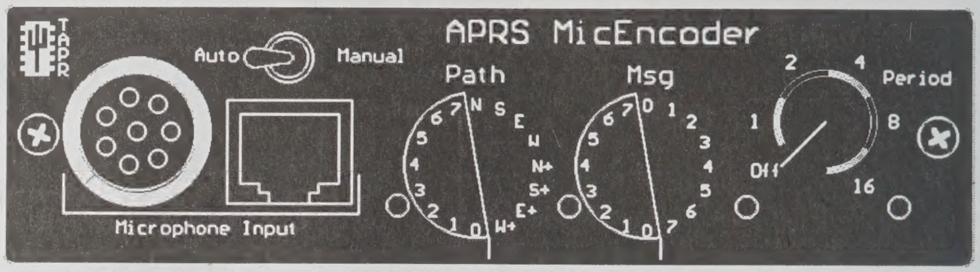
PacComm 1997 Amateur Radio Products Catalog





TAPR APRS™ MicEncoder™ Kit

manufactured by PacComm



As mobile GPS/APRS continues to grow, the need for every mobile to have a TNC, digital radio, and second antenna may be eliminated by simply integrating the GPS position report into a very brief tone burst at the end of a voice transmission over any two-way radio. The APRS™ MIC-E™ is the solution! With the MIC-E™, ***no additional hardware is required*** in the vehicle, other than the GPS unit. The system not only reports position and vehicle type, but also one of 7 canned messages and 4 telemetry values.

The position/identification report is sent in a compressed burst at the end of the voice transmission or can be sent on a timed basis. At the voice repeater, the postion report is removed from the audio path and retransmitted on the APRS channel. Voice repeater users never hear the signal. Operators monitoring the APRS channel will see the location of all MIC-E equipped voice operators as well as the conventional APRS display.

Sales and support of individual units is through TAPR (Tuscon Amateur Packet Radio Assn.), 8987-309 E. Tanque Verde Road #337, Tucson, AZ 85749-9399.Phone: (940) 383-0000, Fax: (940) 566-2544, ttp://www.tapr.org.

For information on quantity orders, orders for Public Service Organizations, or information on PacComm's industrial MicEncoder-type products, contact PacComm directly.

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TNC-NB96/PSK-1 Satellite Duo
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320 Series Packet Controllers
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Our thanks go to many persons for their assistance in bringing the MIC-E to the market. The TAPR APRS™ MIC-E™ Kit was made possible by the pioneering efforts of Bob Bruninga, WB4APR, Will Clement, N3XLM, Greg Jones, WD5IVD, and the active participation of many other Amateur Radio operators and organizations.

PacComm Packet Radio Systems has been designing and manufacturing a wide variety of wireless data communications equipment for the amateur radio and commercial markets since 1985. Tens of thousands are in use around the world in many diverse applications.

PacComm has many products intended for the professional market which are not displayed in this catalog. If you have interest in commercial and industrial applications of data communication, vehicle and object tracking, and related areas, please contact PacComm for additional information.

All information presented in this catalog is believed to be accurate as of the date of publication. Products may be revised and improved at any time without obligation to existing customers.

Major New PacComm Firmware Release for APRS Support

PacComm's latest firmware release 4 supports full remote commanding of the TNC, has an expanded digipeat function to reduce congestion on UI networks, and a rich variety of commands for APRS.

Digipeating Callsign Substitution. The Digipeat command allows ANY combination of the following digipeating filters, or conventional digipeating.
- ***DIGI-SWAP*** - The TNC replaces the alias call with the MYCALL when the TNC digipeats the frame.
- ***DIGI NOT-OWN*** -The TNC never digipeats a frame that was originated with this TNC's MYCALL.
- ***DIGI ONCE*** - The TNC only digipeats a frame once when it finds its MYCALL in the path.

A Password protected **REMOTE COMMANDING** feature uses the following commands:
REMOTE Y|N Enables or disables the remote commanding function in the remote TNC.
RMTcall The command to enter the remote commanding callsign in the remote TNC.
PASSWD Sets the password in the remote TNC used in remote commanding operations.

When a connection is made to the remote TNC's RMTcall callsign, the TNC selects five random letters from the stored password, and sends the remote user five decimal numbers corresponding to the position of these letters within the stored password. The remote user must respond with the corresponding five letters to gain access to the TNC. If the correct response to the password query is entered, the TNC will respond by sending the CMD: prompt. If the wrong password is entered the TNC will disconnect. The response string can contain leading and trailing camouflage characters, as long as the correct five letters are included somewhere in the entered string. The password search is case sensitive.

?APRS? function. When the TNC receives a frame with the data field consisting of ?APRS? it will immediately initiate a full location report to update the calling station.

BRAnge command (beacon timer range) LRAnge for location beacons) allows setting the beacon timing interval to give beacons from once per second to once per day.

The **CONRPT** command sends the location buffers as well as CTEXT (if CMSG is ON) at the beginning of a connection.

The **DISPlay** command has a new display class of DISP G for GPS related parameters.

EBEacon Y|N Beacon echoing to the serial port.
N = no echo of the beacon text sent to the radio port.
Y = send the beacon text to the terminal port when it is sent to the radio port.

ELOC - (Echo Location) Enables or disables echoing the content of LOCation beacons to the serial port.
0 = off, 1 = send to the terminal port only, 2 = send to the terminal and RF port

FIXTYPE establishes how the TNC determines if a good fix exists.
0 = no fix
1 = use the $GPGGA string to verify a good fix
2 = Use a string length of greater than 34 to identify a good fix
3 = Use a match of any search for string to identify a good fix
4 = use only LTEXT search for string as >34 for a good fix

The **FIX Indicator LED** operates according to this LED state table:
Models with single color FIX LED:
OFF - GPS is off, and no fix has been received.
ON - GPS could be on or off, but a good fix was received the last time power was on.
BLINKING - GPS is on, and is searching for a good fix.

Models with dual color (red/green) FIX LED:
OFF - GPS is off, and no fix has been received.
GREEN - GPS off, but a good fix was received the last time power was on.
YELLOW (Red and Green together) - GPS is on and a good fix has received.
BLINKING RED and YELLOW - GPS is on, and is searching for a good fix.

GPS POWER SLEEP. This feature adds the controls to turn off the GPS receiver for battery conservation.
The ***GPSSleep*** command sets the duration in seconds that the GPS will remain off after receiving a good fix. ***GPSLimit*** sets the time limit in seconds that the GPS receiver's power will remain on in the event that no good fix is received.

GPSITEXT is a user settable configuration string sent to the GPS when the TNC is powered on.

GPS- ON|exit character. On single serial port models this command disables the command parser and enables the GPS parser. On dual serial port models this command enables a GPS parser on the primary port allowing both ports to be used for GPS or WX devices.

GPSExit - Sets the command which causes the TNC to exit from the GPS mode. Defaults to '\'.

GPSTEXT, LG1TEXT, LG2TEXT, LG3TEXT fields allow specifying the NMEA GPS sentences to be parsed. Settable to any value, even non-GPS strings for weather station support.

LGETchar - Sets the value of the 'hot key' character used to dump GPS capture buffers to the serial port on 2 port models.

(Please turn to continuation on Page 10)

The WA4DSY 56kb RF Modem

A modernized version of the famous 56kb MSK modem designed by Dale Heatherington, WA4DSY. Licensed by PacComm.

WA4DSY designed a 56kb MSK RF modem in the late '80s which has been used successfully in the Atlanta and Ottawa areas. The modem was sold as a kit by the GRAPES club in Atlanta, and is often called the GRAPES modem.

The new design is a single PC board. Parts count is greatly reduced. Many tune up and operational conveniences have been added.

This modem must be used with a transverter for the desired frequency band.

- Power requirements: +12 VDC @ 300mA.
- Packaged in a PacComm extruded case 7.25" wide x 7.25" deep x 1.5" high.
- Optional 12 volt, 30 W. switching supply. (Powers both modem and transverter).

Interface Connections

Power:	2.1mm round connector
Electrical:	Balanced RS-422 or CMOS
Physical:	DA15 female
IF in/out:	BNC
Transverter:	5 pin DIN, female.

Performance

IF Freq:	29-30 MHz
Output Power:	adj 0.1mW to 2mW
Freq. Control:	Synthesizer 1 kHz steps
Key- up Delay:	0 ms
RX DCD Time:	3 ms
Total Delay:	3 ms

Features

Remote Reset System

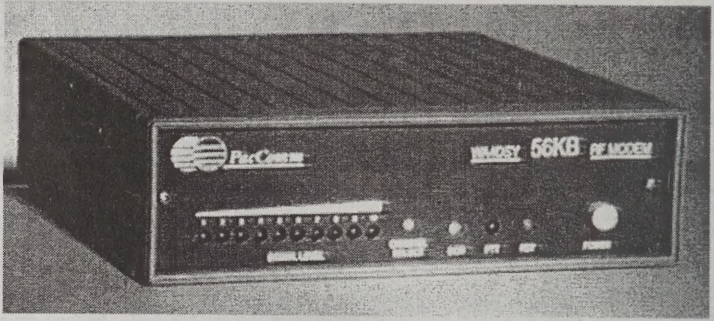
Allows a remote site computer to be reset by remote control.

Built in FIFO Bit Regenerator

Allows the modem to become a full duplex bit repeater with no additional hardware. The RS422 interface remains fully functional when the bit repeater is enabled.

Watchdog Timer

A 2 second watchdog timer turns off PTT after 2 seconds. Resets when RTS goes false. Can be disabled



Built-in Tuning Aids

In "tune up mode" the transmitter becomes a sweep generator to allow tuning the RF coils properly using only a dual trace 30 MHz scope.

LEDs

Ten LED signal strength display. LEDs for READY, PTT, and DCD. There is 1 internal LED which indicates when the Remote Reset Relay is closed.

Switches

Front panel: Power switch (push on - push off), rotary hex frequency selector. Rear Panel: KEY TX : activates transmitter and sends scrambled ones. REMOTE RESET: Sends remote reset code.

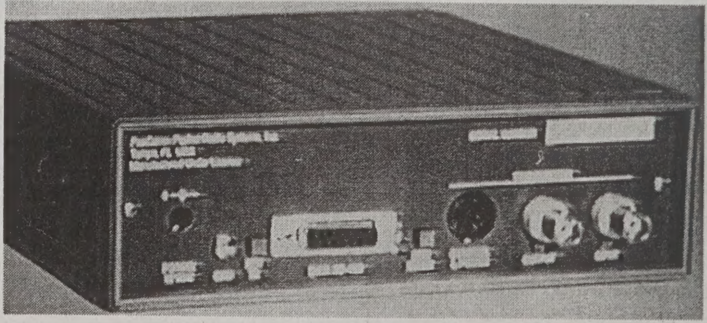
Technology

All the digital logic is implemented in a single Xilinx XC3042A-7 chip packaged in an 84 pin PLCC. Data carrier detection is done digitally in the Xilinx chip. User transmit data is scrambled $(x^{17} + x^5 + 1)$ and converted to NRZI.

A 27C256 EPROM holds both the Xilinx chip programming data and all the state machine and waveform tables for the modem transmitter. It also holds the data which is loaded into the frequency synthesizer at power up. Transmit and receive frequencies are programmed independently.

The only adjustments involve tuning the filters. The special tuning mode should make that task simple. The transmitter signal is compatible with existing 56kB WA4DSY modems.

Drive the 56kb modem with a Gracilis PackeTwin HDLC card or, (for stand alone operation), a PacComm SPIRIT-2 PAD or a Gracilis PackeTen.



The PacComm HandiPacket

HandiPacket Features

- Rugged all-metal case for durability and low RF noise; 1.28 x 2.55 x 4.15 inches.
- Built in heavy-duty 500 mAH battery pack. Up to 10 hours of operation between charges.
- LEDs and RS-232 voltages may be disabled for even longer battery endurance.
- Modem circuit features 'open squelch' operation for better performance in noisy conditions.
- Advanced Personal Message System with 15k Bytes of battery maintained message storage.
- GPS support - six GPS commands.
- Belt clip, Velcro (TM) mounting strap, and computer and unterminated radio cables included at no charge. Battery charger is also included with North American models.
- Six LEDs - DCD, PTT, STA, CON, PWR, and Message Waiting.
- Standard DE-9 RS-232 connector.
- Eight pin MiniDIN radio/ external modem connector.
- Built-in circuitry to support hand held radio PTT circuits.
- AX.25 firmware including KISS and the advanced PacComm Personal Message System.
- 32k battery backed RAM, 4.9 MHz CPU clock speed, 6 MHz rated low power CMOS ICs.

Do you have a

Heathkit Pocket Packet

and wish you could get up-to-date firmware?

You Can!

PacComm offers our latest firmware for the Pocket Packet.

The popular truly portable packet controller.

- Ideal for portable or mobile operation.
- Take a self-powered packet controller wherever you go.
- A personal message system right on your belt!
- Set up an instant digipeater for emergencies
- A reporting station at public service events.
- Use with a handheld GPS receiver and APRS software for an automatic position reporting system (see QEX February 94).

The HandiPacket provides unequalled performance and flexibility. Just compare the features of the HandiPacket with any other unit and you'll clearly see the superiority of the HandiPacket design. This is NOT a small desktop unit with an add-on battery holder!

Sophisticated carrier detection circuit ignores computer hash and other types of noise and interference which is the plague of portable packet operation.

Self-contained Nickel-Cadmium battery pack provides continuous operation of 10 hours on a single charge. Top panel DIP switches disable LEDs and RS-232 drivers for even longer battery life.

Externally accessible controls on the HandiPacket allow Microprocessor RESET and Transmit Level Adjustment. You should never need to open the case.
Uses CMOS 6MHz Z80 CPU and CMOS 8530 HDLC IC. EPROM is socketed to allow easy firmware upgrades. Modem uses TCM3105 modem IC.

The Personal Message System (PMS) is an advanced personal mailbox/mini-BBS. About 15k bytes of battery backed RAM are allocated for message storage in the HandiPacket. See the PacComm Firmware specifications page of this catalog.

Rugged all-metal case. DE-9 male connector for connection to computer or terminal. Eight pin Mini-DIN connector for radio interface cable.

Battery charger & external power connector is a 2.1 mm coaxial socket (positive center).

All HandiPackets come with internal battery pack, belt clip, Velcro™ mounting straps, 6 foot (2 meter) radio cable with tinned leads, computer cable and battery charger. (Note: Battery charger is not included in export shipments due to varying line voltages and electrical codes).

Also included are a comprehensive Operating and Technical manual, circuit schematic and Command Reference Card.

Now available with APRS support!
The HandiPacket is now offered with PacComm's Personal Message System (PMS) and limited GPS support features, or with full APRS support. See page 3 for information on APRS support features now available in PacComm firmware. Please specify PMS or APRS model when ordering.

The PicoPacket Miniature TNC Family

The PicoPackets are exciting and innovative TNCs. Inexpensive too! On-Line HELP makes this the perfect beginners' TNC. So easy to learn!

Some Unique Features of the PicoPacket

- On-Line Help.
- Full-time second port option available.
- Only 1.0 x 2.5 x 3.25 in / 25 x 63 x 83 mm (standard model).
- Slide-on battery pack option.
- Open squelch DCD circuit included on all models.
- Optional internal GPS receiver.

Compact!

Standard model only 1" x 2.5" x 3.25". An inch shorter than a pack of cigarettes.

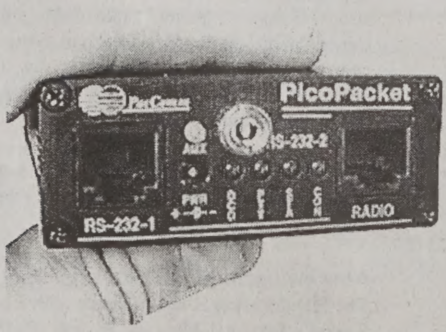
Powerful!

Z-181 high integration MPU with one megabyte address space. A powerhouse.

Inexpensive!

Standard Model with 128K of RAM starting at only $ 149 !!!

Terminal programs for both DOS and Windows included (may be shareware or demo versions).



PicoPacket with Second Serial Port
for GPS Telemetry Input

PicoPacket Standard Model

Complete!

Instruction manual, schematic, Quick Command listing, power cord, 2 radio cables, serial cable and DE-9S adapter included.

RJ-45 radio cables are made of "real" copper wire - solders easily to radio connectors (radio connectors not included).

EPROM and RAM are socketed for ease in upgrading firmware. Memory backup battery is socketed.

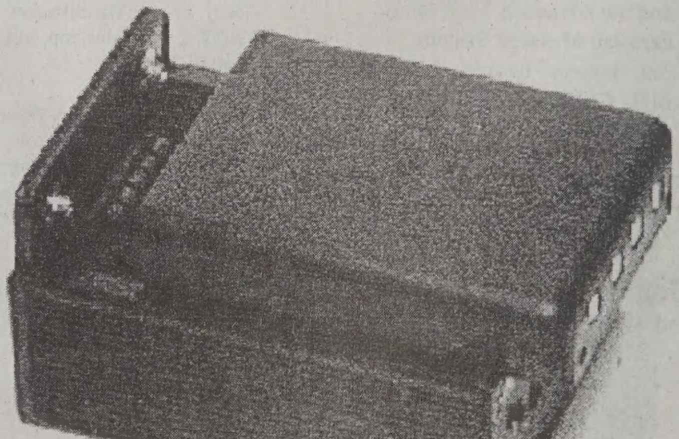
Personal Message System with all the state-of-the-art features.

Battery Pack Option

Each PicoPacket model (Standard, Second Serial Port, Internal GPS) may be ordered with or without the battery pack.

The case of the all battery pack models fit a quick-change 6VDC slide-on/slide-off battery pack which allows continuous operation. The PicoPacket contains a built-in battery charging circuit.

PicoPacket Battery Pack Model



GPS Ready!

The PicoPacket firmware has many features for convenient operation with a GPS receiver.

APRS Support

Full support for APRS (the Automatic Position Reporting System) built-in. Works with APRS through either the standard single serial port or the optional second serial port.

The PicoPacket and APRS work together so that when the Pico with a GPS receiver (internal or external) is controlled by APRS it sends no location beacons except as commanded by APRS. When the APRS computer is disconnected, the PicoPacket automatically becomes a 'Tracker' sending out location beacons at specified intervals.

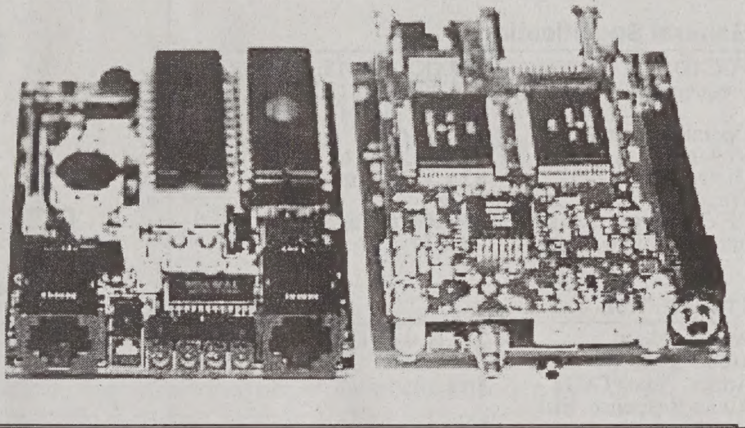
New Firmware Features

- ⇒ Allows use of up to four alias callsigns.
- ⇒ Allows use of up to four GPS sentences.
- ⇒ DIGISWAP function replaces alias callsign with MYCALL on repeated frames.
- ⇒ DIGI-NOTOWN function keeps the TNC from digipeating frames it originated.
- ⇒ DIGIONCE function allows the TNC to digipeat a frame only once regardless of the path.
- ⇒ ELOc command has been refined to offer more avenues for sending location (LTEXT) information.
- ⇒ LTEXT can now be transmitted via the radio port, console port, or both ports.
- ⇒ Password Protected Remote Commanding.
- ⇒ See page 3 for details on new firmware features.

PicoPacket GPS Models

The PicoPacket model with the second serial port option is the ideal TNC for use with a handheld GPS receiver, handheld radio, and laptop (or smaller) computer for APRS activity. One serial port for the computer, a second one for the GPS.

A second RS-232 serial port for the PicoPacket allows both a GPS and computer to be attached to the PicoPacket at the same time. Eliminates the need for a hardware port switch adapter. The Second Serial Port option provides a real-time clock which is updated from GPS time.



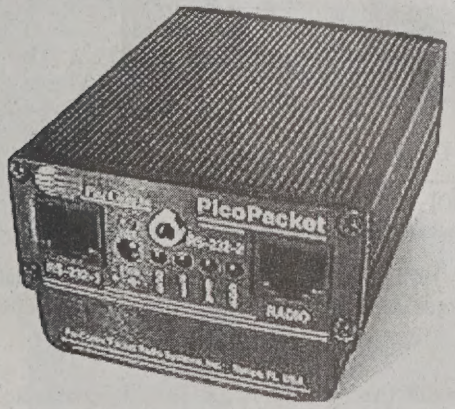
PicoPacket Circuit Board (left) and Trimble Svee6-CM3 GPS Receiver Mounted on a PacComm Support Board (right).

The PicoPacket with the internal GPS receiver is completely self contained in a package under 2.5 x 2.5 x 3.25 inches. Just connect to a handheld radio and you have a complete tracking unit with a full-time serial port to connect to your notebook PC. **A GPS Sleep Funtion in the firmware extends battery life as much as 80%!**

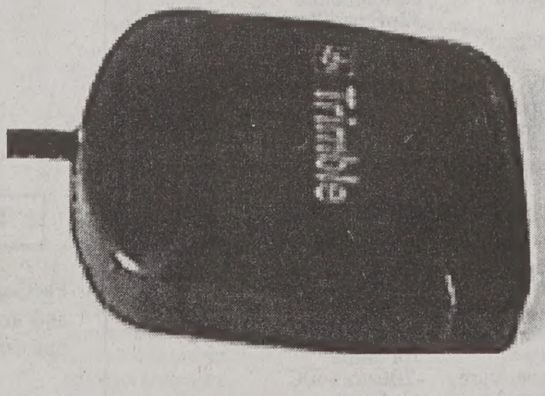
The mag-mount GPS antenna has a footprint less than two inches in diameter, yet it tracks GPS satellites noticeably better than handheld GPS units.

The GPS model has a Trimble SVee6-CM3 GPS receiver fitted directly into the PicoPacket. The GPS receiver can be programmed for RMC only; GGA,RMC,and GSA only (required for use with DeLorme Street Atlas USA Rev. 4.0); or GGA,VTG, RMC, and GLL only. A carrier board physically supports the GPS receiver, regulates voltage, and holds a backup battery for the GPS. The GPS receiver is capable of differential correction.

The PicoPacket with internal GPS receiver includes the second serial port option features, but the second serial port is dedicated to the GPS receiver and is not accessible for other purposes.



Front View of PicoPacket with Internal GPS Receiver and Battery Pack



Trimble Active Antenna

TEKK® Data Radios

TEKK KS-900/900L Specifications

(typical of KS-960 and 1000)

General Specifications

FCC ID	GOXKS-900/15.22.90
Frequencies	450-470MHz (KS-900) 430-450MHz (KS-900L)
Operating Temp	-30 to +60C
Voltage	9.6VDC (7.5 to 12.0)
Dimensions	85 x 52 x 21 mm
Weight	145g
RF Connector	BNC/50 Ohms
Interface Connector	9 pin D

Transmitter

Power output	2W @ 9.6VDC
Modulation	Direct FM
Attack Time (TXD)	8ms
Audio Response	Flat
Distortion	%
Maximum data mod.	50mV for 3.5kHz deviation
Spurious Emissions & Harmonics	<->60dBc

Receiver

Sensitivity	0.35uV
Selectivity	70dB
Spurious Rejection	60dB
Audio Response	Flat
Distortion	5%
Receiver recovery	8ms
Audio output	750mV RMS
Current Drain	20mA
Connector	

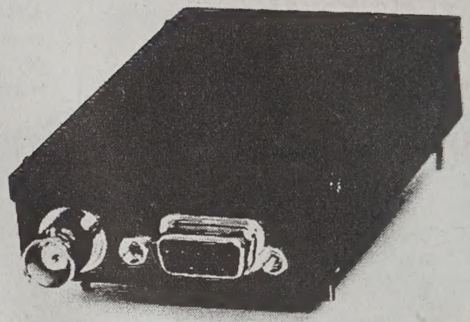
- Pin 1 - +Volts
- Pin 2 - Ground
- Pin 3 - PTT
- Pin 4 - TXA
- Pin 5 - RXA
- Pin 6 - n/c
- Pin 7 - Ground
- Pin 8 - RSSI
- Pin 9 - DCD

Transmitter Crystal Specifications

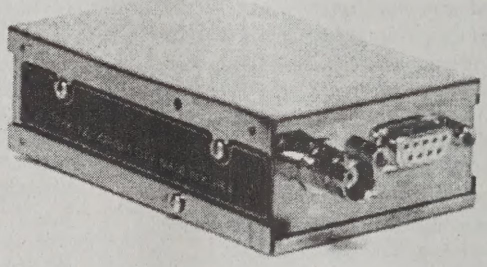
Holder	HC-18/T Wire Lead
Mode of oscillation	Fundamental
Load Capacity	32pF parallel
Series Resistance	20 Ohms
Driver Level	2mW
Holder Capacity	7pF max.
Operating Temperature	-20C to +60C
Frequency Tolerance	+/- 5ppm
Freq Stability	+/- 5ppm
Freq Calculation	(Fc/27)

Receiver Crystal Specifications

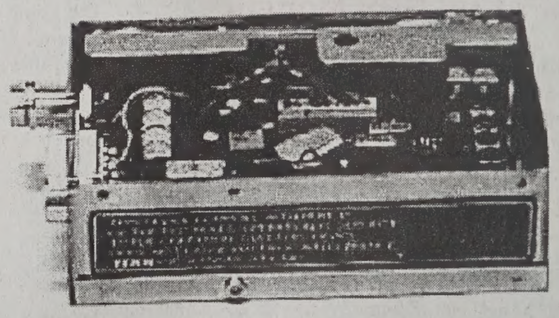
Holder	HC-18/T Wire Lead
Mode of oscillation	Third Overtone
Load Capacity	32pF parallel
Series Resistance	35 Ohms
Driver Level	2mW
Holder Capacity	7pF max.
Operating Temperature	-20C to +60C
Frequency Tolerance	+/- 5ppm
Freq Stability	+/- 5ppm
Freq Calculation	(Fo-21.4)/9



Tekk KS-900/900L



Tekk KS-960/960L/1000/1000L/2000



Tekk KS-1000/1000L 5 Watt UHF Data Radio.

PacComm carries all models of TEKK data radios, for both commercial and amateur frequencies. These radios operate quite effectively at 9600 bps using DFM modulation.

PacComm stocks filters to modify the radios for use at 19.2 kbps data rate. The filters are available installed by PacComm or for user installation.

TEKK® KS-2000

General Specifications

FCC ID	GOXKS-2000
Frequencies	216-222MHz
Operating Temp	-30 to +60C
Voltage	10.8VDC Nominal
Dimensions	85 x 52 x 21 mm
Weight	145g
RF Connector	BNC/50 Ohms
Interface Connector	9 pin D

Transmitter

Power output		3 Watt
Modulation		Direct FM
Attack Time (TXD)	8ms	
Audio Response	Flat	100Hz = +2 to -4dB 4kHz = +2 to -4dB
Distortion		< 5 %
Maximum data mod.		50mV for 3.5kHz deviation
Spurious Emissions & Harmonics		-55dB

Receiver

Sensitivity		0.35uV
Selectivity		60dB
Spurious Rejection	60dB	
Audio Response	Flat	100Hz = +2 to -4dB 4kHz = +2 to -4dB
Distortion		5%
Receiver recovery	8ms	
Audio output		100-300mV RMS
Current Drain		16mA

Maxon® Mobile Radios available from PacComm

PacComm now offers the Maxon SM-2000 Series of mobile radios to the amateur community. The SM-2000 Series are easily modified for 9600 baud operation. PacComm engineers are currently working on a version of the MicEncoder (see page 2) that will be interfaced with a GPS receiver and be embedded in the Maxon radio to produce a complete, all-in-one mobile APRS tracking unit.

Flexibility

The SM-2000 Series scanning mobile radios are formatted for wideband operation and offer programmable channel spacing (12.5 or 25kHz). Per channel power output can be programmed for low (1-3 Watts) or high (1-25 Watts) settings, providing customized radio operation.

For optimum productivity, each radio is equipped with a microprocessor that controls a variety of programmable features like channel scan, priority channel scan, and lookback channel.

Time-out timer and busy channel lock-out features improve radio communications by preventing channel or repeater lock-ups and interruptions during radio use.

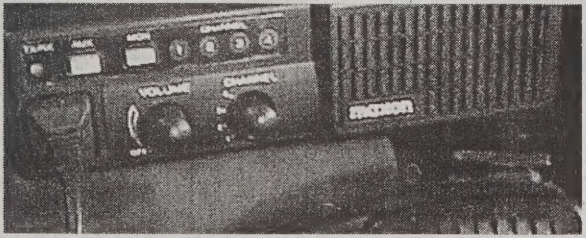
Convenience

The radio's monitor button is located on the front panel , along with an auxiliary button (used for after-market accessories), and a tri-color LED which identifies TX, RX, and busy channel status. Control knobs for channel selection and on/off volume are also within easy reach. Back-lit numbers identify channel selectors at a glance.

The SM-2000's compact size allow for convenient and easy installation.

Reliability

Designed and manufactured to meet military-type standards (MIL-STD 810 C, D, and E), the radios will withstand years of use and provide outstanding performance. The radio's strong, die-cast aluminum chassis protects inner components from accidental impact.



SM-2000 Series Specifications

GENERAL	**VHF Model SM-2150**	**UHF Model SM-2450**
Frequency Range	148-174Mhz	440-470MHz
Channels	4	4
Channel Spacing	12.5/25kHz	12.5/25kHz
Channel Increment 1	2.5kHz	12.5kHz
Conventional Tone Signaling	Multiple channel CTCSS/DCS	
Power Source	13.8 VDC negative ground	
Current Drain	0.15 A Standby 1.0 A receive 8.0 A transmit	0.15 A Standby 1.0 A receive 8.0 A transmit
Circuit Protection	10 Amp fuse	
Operating Temperature	-22° F to +140°F (-30°C to +60°C)	
Dimensions (H x W x D)	2" x 7" x 6.25" (45 x 157 x 140mm)	
Weight	3lbs., 6oz. (1.6kg) w/microphone	
FCC Compliance	Parts 15,22,74 80, 90	Parts 15,22,74 80,90
FCC Identifier	---	F3JSM2450
IC Certification #	---	153 194 331A

TRANSMITTER (measurements made per TIA/EIA-603)

RF Output	1-3 Watts, low 1-25 Watts, high	1-3 Watts, low 1-25 Watts, high
RF Output Impedance	50 ohms	50 ohms
Channel Spread	26 MHz	30 MHz
Spurious and Harmonic Emissions	-65 dB	-65 dB
Modulation	8K5OF3E, 16KOF3E	
FM Hum and Noise	-40dB	-40dB
Audio Distortion	<5% @ 1kHz	<5% @ 1kHz
Frequency Stability (-30°C to +60°C)	+/- 0.0005%	+/- 0.0005%

RECEIVER (measurements made per TIA/EIA-603)

Sensitivity(12db SINAD)	.28uV	.35uV
Selectivity	-70dB	-70dB
Channel Spread	26MHz	26MHz
Intermodulation	-65dB	-65dB
Rated Audio Output	4 watts	4 watts
RF Input Impedance	50 Ohms	50 Ohms
Hum and Noise	-40dB	-40dB

Specifications subject to change without notice.

The TI3DJT CoaxLAN

The CoaxLAN adapter replaces complex diode matrices in Node/Switch stacks with a system which communicates using just a signal and ground wire.

The CoaxLAN detects data on the "bus" or LAN and flow controls the attached TNC serial port off. Transmit drivers are tri-stated except when transmitting.

The **CoaxLAN is now built-in to the SPIRIT-2 TNC**, providing simple inter-linking for TheNet Node Stacks and ROSE Switches.

- LEDs allow easy monitoring of data in and out of each Node or Switch.
- Small size - in a DE-9 cable housing.
- Connects directly to the TTL serial port of TINY-2 or MFJ TNCs.
- Convenient, shielded connections. Lengthy cable runs (3000 ft.) between node TNCs possible.
- Increased fan-out. More TNCs per stack.
- Allows 38.4 kbps data rate when used with the TINY-2 MK-II Node. Rapid interprocessor communications.
- Older TINY-2, MICROPOWER-2, and MFJ TNCs can be used if 5VDC is jumpered to the TTL connector to power the CoaxLAN.

Please specify ROSE or TheNet Model when ordering.

TINY-2 Memory Expansion

The PacComm Memory Expansion Adapter installs in most PacComm TNCs and many other Z-80 based TNCs to provide 64k battery backed RAM message storage for use by PacComm's Personal Message system.

The adapter board plugs into the TNC Z80 CPU (8400 or 84C00) socket to provide access to the data and address lines. No soldering required. The CPU chip mounts on the adapter, along with the additional RAM IC and decoding logic.

A special version EPROM replaces the original. The EPROM provides PacComm's latest version of AX.25 firmware and Personal Message System and automatically manages the additional memory space.

Models are available for all PacComm TNCs except the HandiPacket (no space!): TNC-200, TNC-220, TNC-320, PC-320, TINY-2, TINY-2 MK-2, MICRO-POWER-2. Note: The SPIRIT-2 and PicoPacket have built-in expanded memory circuitry.

The Memory Expansion adapter cannot be used on the TINY-2 in conjunction with the MC-NB96 modem accessory card or the AD-4 Analog-to-Digital converter accessory because all three occupy the same physical location on top of the TNC.

Major New Firmware Features, continued from page 3

The **LOCation** command controls a beaconing facility tied to the GPS capture buffers.

LPATH is analogous to UNPROTO - the path by which location beacons will be sent. [Beacons to out via UNPROTO, Locations go out via LPATH.]

LTEXT is a location capture buffer analogous to BTEXT. The GPS parser puts the GPS string specified in GPSTEXT into LTEXT, thus saving BTEXT for normal beacons. Similarly LG1TEXT is stored in the L1TEXT capture buffer, LG2TEXT in L2TEXT etc.

MYAlias, MY1alias, MY2alias, MY3alias. Four alias callsign fields.

The **QRA** function has been added. When a UI frame is received addressed to QRA-0, the TNC will respond after a random time of up to two minutes with an ID frame.

RTCsync - Synchronizes the TNC clock to GPS received time.

The **TDMA** function provides a time-slotted location beaconing system which effectively eliminates the hidden transmitter problem. It works with the LOC and Beacon commands to allow beaconed text or location reports (or any strings parsed by the capture function) to be transmitted once per minute, or once per hour. In addition, short duration transmissions (such as those at 9600 bps) may use sub-second slotting. In the maximum configuration ten subslots per second, 60 seconds per minute, and using one beacon per hour will accommodate reporting from 36,000 stations. Such time sensitive transmissions are made possible by reference to the GPS time (see RTCSync command.)

The following commands work with the capture buffers (LTEXT, L1TEXT, L2TEXT, and L3TEXT.)
- ***LSLOT*** takes a value of 0 to 59 indicating the second to be used. A value of 60 disables the function.
- ***LSLOTMIN*** takes a value of 0 - 59 which selects which minute of the hour will be used. If set to 60 then LSLOT will be asserted every minute.
- ***LSUBSLOT*** takes a value of 0 up to the value of LSUBNUMB. This defines the subslot used.
- ***LSUBNUMB*** takes a value of 0 to 9. 0 = no extra subslots, i.e. the subslot is the complete slot. 1 = one additional subslot (a total of two), etc, up to 9 which allots 10 slots of 100 mS.

The following slots enable TDMA transmissions using the BTEXT data field.
- ***BESLOT*** Y|N switches between TDMA beacon timing (Y) and conventional beacon timing (N).
- ***BSLOT*** takes a value of 0-59 indicating which second is to be used, 60 disables the function.
- ***BSUBSLOT*** takes a value of 1 to 9 indicating which tenth of a second slot to be used.

UIMODE puts the TNC directly into CONMODE upon power-up, bypassing the cmd: prompt.

Available for ALL PacComm TNCs, all TNC-2 Compatible TNCs, and the Heathkit HK-21.

The PacComm PacTOR Controller

What is PacTOR?

PacTOR is a robust ARQ radio-teletype mode developed by German amateurs, in particular DL6MAA and DF4KV. It was designed to overcome the shortcomings of packet and AMTOR in HF operation.

AMTOR (based on SITOR) was specifically developed for HF radio text communication. Even during very poor signal-to-noise conditions a useable connection can be maintained when a packet connection would be impossible. However, 5-level code is used making binary data difficult to send and error detection is rather weak leading to 12% chance of bad characters. Effective throughput is only 35 baud.

PacTOR provides a more robust error correction scheme and better throughput than AMTOR. The synchronous transmission format and short frame size of AMTOR are retained for excellent performance under poor propagation. The result of this protocol design is a hardware/software system which gives a four-fold throughput increase over AMTOR while continuing to be useable for typical ham QSOs as RTTY and AMTOR operators have become accustomed to.

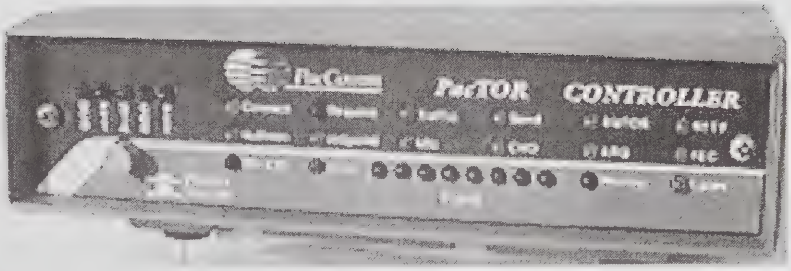
PacTOR requires an HF radio capable of changing between transmit and receive modes in 130 ms. Any AMTOR capable radio will operate properly with PacTOR.

PacComm's PacTOR Controller

The PacComm PacTOR Controller is produced under license from the German developers. It uses the German firmware with all commands and messages in English.

The PacTOR unit also supports AMTOR and RTTY operation making it ideal for all data modes of HF operation. PacTOR will accept a call in either PacTOR or AMTOR and automatically respond in the correct mode.

PacTOR commands are similar to packet commands and are easy to learn and use. Complete amateur callsigns are supported.



An internal mailbox is accessible from either PacTOR or AMTOR modes. Many file and message handling functions are supported.

PacComm's PacTOR unit is capable of either 'high tones' or 'low tones.' Tone pairs are user selectable by internal jumper settings. All filters are adjustable for optimum performance at the tone frequencies selected.

PacComm's PacTOR however, is not an exact reproduction of the German hardware. In fact it is a complete redesign of that unit. Our unit has received excellent reviews from QST, QEX, Ham Radio Today (UK), RTTY Digital Journal, etc.

The modem section of our unit performs exceptionally well because of careful groundplane layout and lack of proximity to the digital section of the unit. This results in superior signal-to-noise performance and extended connects under adverse band conditions. PacComm's unit beats the others by at least 6dB in this respect.

Memory ARQ

One of the key features of the PacTOR mode is Memory-ARQ. Copies of corrupted frames are saved and are correlated with frames received later.

The key to proper Memory-ARQ operation is having an analog to digital converter (ADC) - an item of hardware. The ADC converts the actual strength of each received bit into an 8 bit value which is stored in memory for later comparison. Thus each bit can have an exact representation of its received value. If Memory-ARQ is attempted without the ADC, the value of each bit must be rounded down to a zero or up to a one to be stored and the 'marginal value' of the signal is lost.

Most anyone's implementation of PacTOR will work fine under good conditions. When the QRM is tough and the band is fading, the PacComm PacTOR will continue to decode signals too weak to hear. The 'software PacTOR' units will have long since lost the connection. Doing it 'right' costs more, but the performance improvement is worth the cost.

Terminal Program

PacTOR is designed to be used with conventional RS-232 ASCII terminals or personal computers running terminal emulator software.

PacComm supplies a diskette with each PacTOR unit which contains the Meister Term (MT) public domain terminal program specifically designed for the PacComm PacTOR unit. PacComm's PacketPet for Windows terminal program also supports PacTOR usage.

The PacComm PTC-II Multimode DSP Communication Controller

The PTC-II is a new multi-mode controller and "communications platform" which contains very powerful and flexible hardware and firmware.

It is built in the United States by PacComm under license from S.C.S., the developers of the original PacTOR.

The PTC-II offers the most robust HF digital protocol available to radio amateurs, but it should not be overlooked that the PTC-II is also a triple-port multimode controller with packet data rates of 1200 and 9600 bps and other HF data modes.

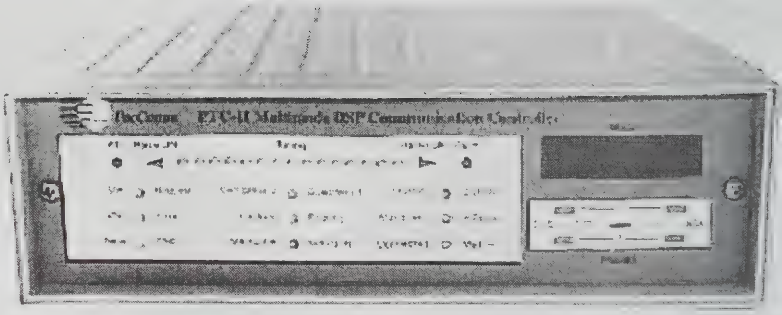
What is PacTOR-II?

PacTOR-II is a communication system. There is a unique protocol, carefully designed and optimized for excellent HF performance, new and powerful modems realized via Digital Signal Processing, and a hardware platform to allow the firmware to realize its full operating potential.

PacTOR-II is the name of the new protocol including modulation specifications. PTC-II is the name of this specific hardware realization of the PacTOR-II architecture.

Latest Firmware Features

- Audio filtering capability
- Radio control



PacTOR-II Features and Advantages

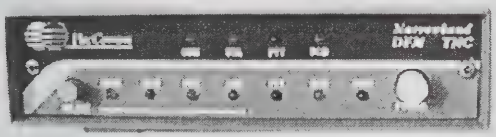
- A step-synchronous ARQ protocol.
- Full support of memory ARQ.
- Independent of sideband; no mark/space convention.
- Center frequency adjustable between 400 and 2600 Hz to exactly match your radio's filters.
- Long-path capability for worldwide connectivity.
- Full compatibility with the original PacTOR-I, AMTOR, and RTTY.
- All-mode mailbox with up to 32 megabytes of storage.
- Automatic switching between Level-1 (PacTOR-I) and Level-2 (PacTOR-II) at contact initiation.
- Occupies a bandwidth of under 500 Hz - use your 500 Hz CW filters.
- Constant bandwidth irrespective of actual transmission speed.
- Differential Phase Shift Keying with two continuously transmitted carriers. 100 symbols per second.
  - DBPSK modulation yields 200 bps (uncompressed).
  - DQPSK modulation yields 400 bps (uncompressed).
  - 8-DPSK modulation yields 600 bps (uncompressed).
  - 16-DPSK modulation yields 800 bps (uncompressed).
- Powerful Forward Error Correction (FEC):
  - High performance convolutional coding.
  - Constraint length of 9.
  - Viterbi decoding using soft decision point.
  - Coding rate varies between 1/2 and 7/8.
- Intelligent data compression monitors compression ratio and self-bypasses if not being effective.
  - Huffmann compression for English or German text.
  - Markov (2 level Huffmann) compression.
  - Run-Length encoding for repeated sequences.
- 10 character MODE display, numerous multi-colored LED tuning and status displays.
- **Watchdog timer on HF PTT port (a PacComm exclusive).**
- Specialized communication program provided.
- Firmware contained in Flash memory. Easy to upgrade.

1200 baud AFSK and 9600 baud G3RUH compatible packet modem add-in cards for the PacTOR-II are available at extra cost.

PacComm also offers a GPS carrier board to interface an internal GPS receiver with the PTC-II.

TNC-NB96 and PSK-1 Satellite Modem Combo

TNC-NB96 1200/9600 Baud TNC



The TNC-NB96 consists of a TINY-2 MK-2 TNC with open squelch adapter and a G3RUH DFM modem.

A front panel push button switch selects between 1200 AFSK, 9600 DFM, 1200 baud PSK (if PSK-1 is attached) and whatever modem is connected to the rear-panel modem accessory connector.

The TNC-NB96 is the perfect companion to the PSK-1 Satellite Modem. The switching circuitry in the TNC-NB96 and the PSK-1 operate together to allow access to the 1200 bps Microsats and the 9600 bps UoSATs through the same multimode transceiver.

TNC-NB96 Features

- G3RUH design modem provides excellent 9600 bps performance.
  - ⇒ Jumper configurable for 19,200 bps.
- Rear panel accessible TAPR-style modem disconnect header.
- 32k non-volatile RAM. Provides over 14k message storage.
- LED Message waiting indicator.
- 64kB EPROM contains two 32kB EPROM images (selectable by rear panel switch).
  - ⇒ PacComm's latest firmware including Personal Message System local mailbox
  - ⇒ WA8DED host mode.
- 1200 bps AFSK port has digital DCD adapter for use with unsquelched radios.
- Rugged extruded case - 6 x 7 x 1 7/8 inches. Grey epoxy finish. Weight 35 oz. (1kg).
- Serial rates of 300 to 38.4k baud, jumper selected.

TNC-NB96 and PSK-1 Satellite Modem Combo

These two units are designed to work together to make a complete packet station for both the 1200 bps PSK and 9600 bps satellites. When ordered as a combination, they are provided with pre-made interconnection cables. Only the radio attachment cable needs to be terminated. All satellite and terrestrial modes are selected by push buttons. Supports 1200 bps AFSK, 1200 bps PSK, 9600 bps DFM.

PSK-1 Packet Satellite Modem

The PSK-1 converts a standard 1200 baud AFSK TNC which has an accessory modem header to operate with packet satellites. It provides 1200 baud Manchester encoded AFSK output for satellite uplink and decodes 1200 baud PSK signals downlink signals. Also decodes 400 baud telemetry from Oscar 10 and 13.

Transmits and receives 1200 baud PSK for terrestrial HF use.

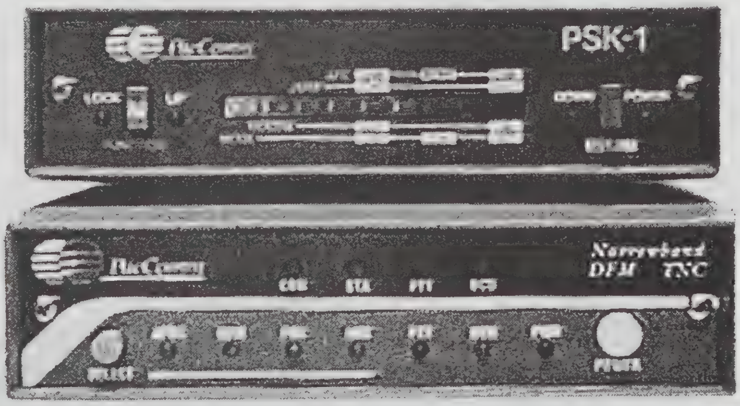
PSK-1 Features

- All modes and functions selected by front panel push buttons, or by menus if the computer control port is used.
- Switching between standard packet and satellite operation by push button or computer command.
- Excellent sensitivity.
- Wide range Automatic Gain Control circuit.
- Automatically tunes downlink radio via UP/DOWN control lines to compensate for Doppler frequency shift.
- Interfaces easily to the PacComm TNC-NB96 for 9600 bps and 1200 bps satellite operation.
- LEDs show signal lock and step-up, step-down pulses.
- LED bargraph displays proper signal tuning, also shows mode and functions selected.
- Rear panel connections:
  - ⇒ Uplink radio
  - ⇒ Downlink radio
  - ⇒ TNC radio port
  - ⇒ TNC modem disconnect header
  - ⇒ Telemetry and control port
  - ⇒ Power.
- Operating manual contains detailed installation and interface instructions.

One year factory parts and labor warranty, 30 day return privilege. Shipped with all interconnecting cables, User's Manual, Command Reference Card, and complete schematic diagrams. Power supply provided (North America only).

TNC-NB96/PSK-1 Satellite Modem Combo

Completely interfaced, just terminate the radio cable !!!



TCP/IP Solutions Gracilis Products by PacComm

PacComm now manufactures and supports the Gracilis product line. Gracilis engineers provide software support.

These products allow the serious radio network user to use AX.25, NET/ROM, and TCP/IP protocols simultaneously.

The PackeTwin is a two channel communications controller (HDLC) card for use in the 8 bit ISA PC bus. It uses the 85230 Enhanced Serial Communication Controller.

The PackeTwin supports one DMA channel and one polled channel. Uses only one PC interrupt (IRQ) for both channels.

It will operate two asynchronous (RS-232/422) channels or one asynchronous channel and one radio channel. Both ports are configured with RS-232 drivers, but RS-422 drivers are available on special order.

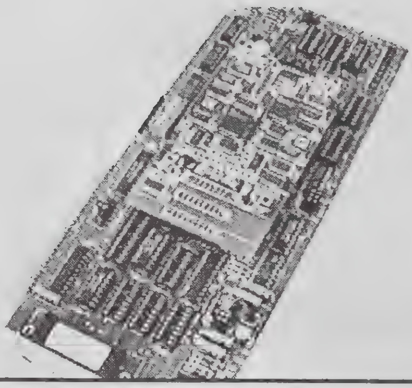
Hardware watchdog timers are provided on both ports.

The PackeTwin can drive external modems on both ports, or support one 9600/19200 DFM modem on a daughterboard and one external modem.

Device drivers are available to support the KA9Q NOS and FTP Software, LINUX, and PC/TCP for Microsoft Windows and DOS.

The PackeTwin supports internal or external clocking, NRZ or NRZI.

The Gracilis PackeTen Network Switch is a high-speed multiport packet radio data switch compatible with AX.25, NET/ROM, and TCP/IP protocols. By combining CISC/RISC processing technology with network compatibility, the PackeTen is capable of supporting today's services with the performance and features required of tomorrow's networks.



PackeTwin card with PacComm Surface- mount 19k2 DFM Modem installed.

The PackeTen (P-10) uses the Motorola 68302 multiport procesor which is capable of megabit data speeds on three channels. The P-10 may be configured for five asynchronous (RS-232/422) wireline channels or four synchronous (radio) channels or any combination.

Standard firmware provides full support for ARP, ARPA/Berkeley services and SMTP, allowing full gateway bridging from the Ethernet/UNIX environment, the radio circuit, and the Internet.

A user conference mode is also available for non-host related data transfers.

Configurations

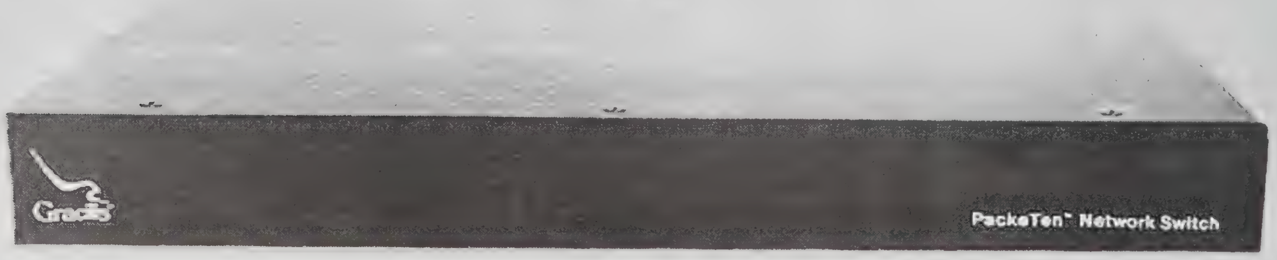
Both of these products may be fitted with PacComm modems which use AFSK, MSK or DFM modulation, and operate at speeds from 1200bps to 64kbps. Both also will drive the PacComm WA4DSY 56kb MSK modem.

The PackeTwin makes an ideal single user support card for the PacComm WA4DSY 56kb MSK modem. Drive the 56kB modem via the DMA channel and use the interrupt driven channel for 9600/19200 DFM operation.

Optional Modems Available for Gracilis PackeTwin and PackeTen

All optional modems for the PackeTwin and PackeTen use surface mount technology for a durable, compact design that offers the same reliable performance as PacComm's family of "full size" packet modems.

PT-1200	1200bps AFSK Modem
PT-24M	1200/2400bps MSK Modem
PT-4800	4800bps DFM Modem
PT-9600	9600bps DFM Modem
PT-19K	19200bps DFM Modem
PT-38K	38400bps DFM Modem
PT-56K	57600bps DFM Modem



The “320” Series Dual-Modem HF/VHF Packet Controllers

The PacComm '320' series consists of two dual-modem HF/VHF packet controller models. The units share many features, including excellent HF packet performance.

The PC-320 is configured as a 3/4 size plug-in card for PCs and compatibles.

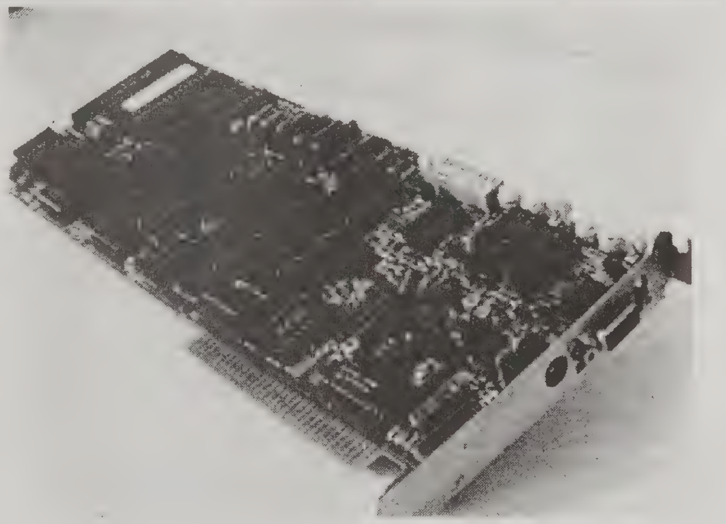
The TNC-320 is a conventional stand-alone TNC.

Features Common to Both 320 Series Models

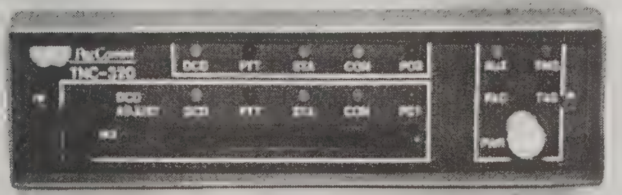
- Separate modem circuits for optimum VHF and HF operation.
- Uses the EXAR 2206/2211 PLL modem and 6 pole active filter for superb HF operation. Superior HF carrier detection performance.
- HF modem filter may be bypassed and the modem retuned to support VHF tones.
- Expanded auxiliary modem header supports PacComm's G3RUH 9600/19200 baud modem and PSK-1 satellite modem.
- Radio port selection is by a single keyboard command which also selects a separate heard log, radiolink and various parameters.
- The AX.25 firmware uses the TAPR command set with numerous additional commands to support PacComm features and enhancements. Supports TCP/IP via the built-in KISS module.
- Personal Message System (PMS) with manual and reverse forwarding. The PMS allows the packet controller to support all standard packet functions while allowing messages to be entered or read by an over-the-air user.
- PMS message space expandable to 128k via installation of the PacComm Memory Expansion Adapter.
- Each unit comes with a comprehensive Operating/ Technical Reference Manual, a Command Reference Card, and a circuit schematic. Mating connectors for the RS-232 computer connector (TNC-320 only) and the radio and power connectors are provided.

PC-320 PC Packet Controller Card

- Extensive filtering for quiet operation.
- Appears as a regular PC serial port (COM 1-4). Multiple PC-320 cards may be installed in a PC.
- Uses any terminal program, just like an external TNC.
- TSR program provides on-screen tuning and “simulated LED” display.
- Dual powered - operates from PC power or external power. Continues full operation even when PC is turned off!
- 10 inches long, 4.13 inches high, 5/8” thickness.
- Nine pin (DE-9S) radio connector allows both HF and VHF radios to always remain connected.
- Options: Dual-radio cable, hardware clock, external power supply, Open Squelch DCD, 9600 bps DFM modem.



TNC-320 Stand Alone Packet Controller



- The TNC-320 front panel features a horizontal LED bargraph tuning display, HF threshold control, and 14 multi-colored status LEDs grouped for instant recognition.
- LEDs display activity on the RS-232/TTL data lines.
- The TNC-320 requires 12-16 volts DC @ 280mA. The “low power” option reduces current draw to 150mA.
- Available Options: Hardware clock, Open Squelch DCD adapter, 9600 bps DFM modem.

MC-NB96 Internal DFM Modem Card

The MC-NB96 internal modem card is designed to attach directly to the TAPR style modem disconnect found on all PacComm TNCs. Also fits all TNC-2 derivatives and TNC-2 compatibles with a modem disconnect header.

Upgrade your TINY-2 to 9600 operation far less expensively than purchasing a new 9600 TNC. Combine the MC-NB96 with the TINY-2 MK-2 Node for an economical 9600/19200 bps network link.The low cost alternative for upgrading existing 1200 baud network links to 9600 bps or 19200 bps or higher.

- All baud rate sensitive components (14 of them) are mounted on a plug-in header.
- Transmit and receive sections are isolated for superior full duplex performance.
- Transmit and receive voltage references are separated and Zener diode stabilized.
- Transmit audio may be enabled or disabled during receive.
- An on-board DCD LED makes troubleshooting convenient.
- The DCD signal may be jumpered to be active high or low.
- DCD circuitry provides a stable DCD indication.
- Receive audio may be gated by the DCD signal or run continuously.
- Comprehensive bypassing and a large ground plane make the board very quiet.

The Analog-to-Digital Converter Accessory - Model AD4

Use with any network node which uses TheNet X1J or later network code.

AD4 Capabilities

The AD4 has four channels of analog-to-digital conversion. These channels may be used in a variety of ways as desired by the user. The factory setup is as follows. Note that the S-Meter function requires connection to the reciever IF.

- Channel 1 used for relative deviation measurement of received signals from receiver audio.
- Channel 2 used for voltage measurements or S-meter reading of received signals (with optional radio interface installed).
- Channel 3 used for voltage measurement (normally used with solid-state sensor for temperature measurement).
- Channel 4 used for voltage measurement (typically humidity using the appropriate sensor, or a second temperature reading, or supply voltage).

When fitted to existing TNC-2 compatible TNCs using TheNet X1J firmware, these measurements become available to the end-user in the MHeard list.

There are two models of the AD-4. The ‘CPU’ model plugs into the Z-80 CPU socket of the TNC and the processor IC plugs into the AD-4.

The SPIRIT-2 model plugs into a header on the TNC specially provided for the AD-4.

'Open Squelch' Digital DCD Adapter

The PacComm DCD Board is based on a design by Eric S. Gustafson, N7CL. This digital DCD circuit allows the radio to be operated unsquelched by generating a DCD signal only when a packet signal is present.

Why is it useful?

Unsquelched radio operation is useful when the radio has slow, insensitive squelch action or poor hysteresis. Weak signals are sometimes lost due to a slow opening squelch, and link throughput is reduced because longer transmit delay times must be used to wait for the squelch to open. Some squelch circuits can be fooled by even moderate amounts of noise or hash present in the IF.

The PacComm DCD is a surface mount card that measures 1.85" x 1.25" (47 x 38 mm) and can be ordered in three styles;

- DCD-3105. Plugs into the socket of a TCM3105 modem IC and carries the DCD-3105.
- DCD-Header. Plugs directly into the pins of a TAPR-style modem disconnect header (20 or 26 pin).
- DCD-Universal. May be integrated into other packet controllers (not limited to the TCM 3105 modem IC) by directly wiring to the circuit board and modem IC.

The DCD circuit is included in the HandiPacket, IPR-NB96, TNC-NB96 and PSK-1T. A similar circuit in part of the PicoPacket.

The PacComm
TINY-2 MK-II/GPS

Want to experiment with Automatic Position Reporting System (APRS) tracking of your boat or vehicle?

The TINY-2 MK-2/GPS integrates a Trimble SVee6-CM3 OEM GPS module inside the TINY-2 case for convenient and trouble free operation.

Firmware Features

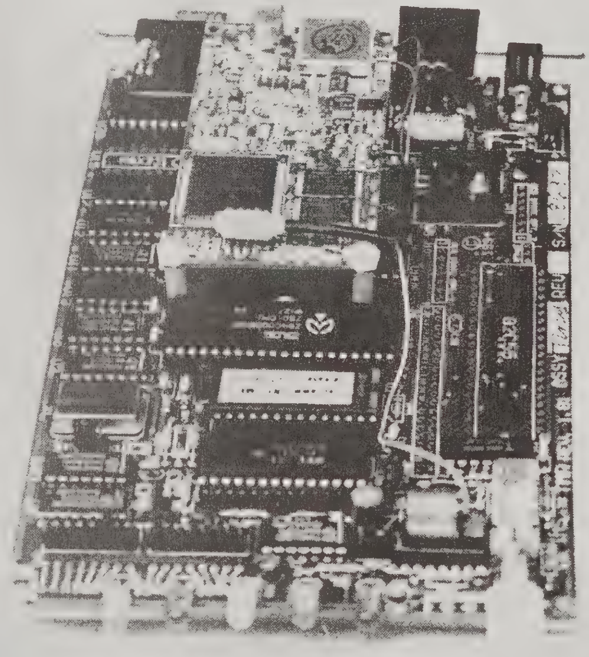
- Switch from using your TINY-2 as a regular TNC to a remote vehicle tracker by executing one simple command.
- PacComm's latest firmware including PacComm's famous Personal Message System local mailbox.
- NMEA command structure compatible. Uses any NMEA GPS output string to place latitude, longitude and satellite availability into CText, LText, SText, etc.
- A dedicated 'beacon function' is available for location information. LOCATION command (like BEACON command), LTEXT (like BTEXT), LPATH (like UNPROTO).
- Select decoding ANY NMEA GPS output string with the GPSTEXT command.
- The GPSITEXT command allows sending a custom configuration string to the GPS at power-up for custom applications. The Trimble GPS supplied with PacComm units has custom firmware to accept this initialization.

Hardware Features

- **Low power consumption:** TNC, GPS & antenna: 280 mA.
- **Options:** Open Squelch DCD Adapter, Hardware Clock.
- SVee6-CM3 GPS bolts securely to mounting holes on the TINY-2 circuit board.
- The EPROM switch on the TINY-2 is converted to use as a Terminal/GPS switch. Set the switch one way and you can program the TINY-2 with commands, set the switch the other way and the GPS is connected and automatically updating the TINY-2 buffers.
- A differential GPS version of the Trimble GPS is available at a small additional cost. The unit monitors the packet channel for DGPS updates while also transmitting its own position.
- The TINY-2/GPS is supplied with an active antenna (mag-mount) which is more sensitive than hand-held units. The antenna has a 15ft lead for convenient placement on any vehicle.

Ordering Information

Order model TINY-2/MK-II/GPS. Delivery is from stock to three weeks depending on availability of GPS receivers.



TINY-2 MK-II with Trimble SVee6-CM3 GPS Receiver installed.

The TINY-2 MK-II Multipurpose TNC

Improved
Value!!!
10MHz
CPU
SIO
EPROM
and
RAM
now
Standard Equipment
on every TINY-2 MK-II !!!

The TINY-2 MK-II is a 1200 baud AFSK TNC which may be used in many ways in the amateur radio world. It is low priced, but a quality product.

A *GREAT* 'first TNC'

- Easy to use. Normal operation uses less than ten commands.
- PacComm's Personal Message System local mailbox with automatic forwarding features.
- GPS features included in standard model.

A Network Node

- Works with ROSE, NET/ROM, TheNet and all TNC-2 type network EPROMS.
- TINY-2 may be upgraded to 9.8MHz CPU clock speed for heavy channel use or for data speed of 9600 bps or higher.
- Factory installed accessory modem header takes all PacComm and TAPR compatible modem cards.
- TINY-2/NODE model is supplied without an EPROM for user installed node firmware.
- Optional AD-4 Analog to Digital board for use with TheNet X1J firmware.

A GPS Tracker TNC

- APRS (Amateur Packet Reporting System) support features are standard.
- Places GPS location string into CText, LText, SText, etc.
    - Will beacon location periodically.
    - May be polled for position.
    - Responds to ?APRS? queries.
- Available with internal GPS receiver.
- Switch from using your TINY-2 as a regular TNC to a remote vehicle tracker by executing one command.

Advanced Applications

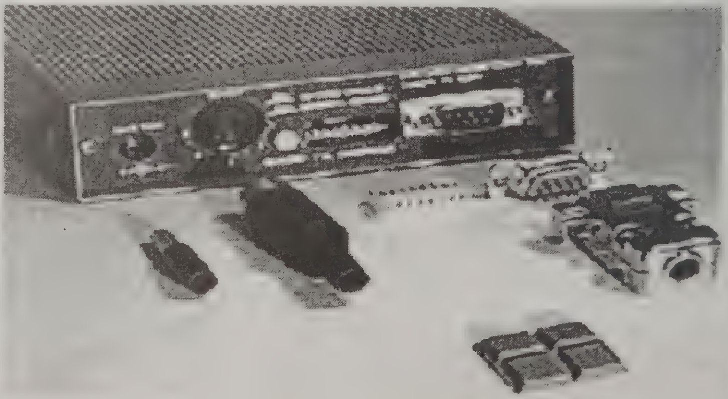
- WA8DED host mode.
- KISS mode for satellite and TCP/IP.
- Telemetry via RS-232 or TTL port.
- Packet communication for a weather node.

Features

- TNC-2 EPROM compatible
- Low power consumption: 45 mA.
- 32k RAM. Over 13k message storage.
- Multicolored LED's - PWR (Power), CON (Connect), STA (Status), Push-to-talk (PTT), Data Carrier Detect (DCD).
- LED Message waiting indicator.
- 64kB EPROM contains two images selected by rear panel switch.
    - PacComm's firmware.
    - WA8DED host mode.
- Rugged extruded case - 5 x 7 x 1 3/8 ins (130x180x35mm). Grey epoxy finish. Weight 18 oz. (500g).
- Both TTL level and RS-232 level serial ports to computer/terminal. Serial rates of 300 to 38.4k baud, jumper selected.
- Comprehensive User's Manual, Command Reference Card, complete circuit schematics provided.
- All mating connectors provided.
    - Power plug (2.1 mm).
    - 5 pin DIN plug.
    - RS-232 solder cup connector and hood.
    - 8 Pin in-line connector provided for TTL connections.

Options (Available at extra cost)

- 64 kB memory expansion.
- Digital DCD accessory for open squelch radio operation.
- Hardware clock accessory for time retention when power is off.
- AD-4 Analog-to-Digital conversion board for use with TheNet X1J.
- MC-NB96 G3RUH modem card upgrade - 9600 or 19200 bps.



New!

Introducing the SPIRIT-2/RF

The SPIRIT-2/RF is the ideal low cost dedicated end-user link to a BBS, node site or DX Cluster. In addition, it is equally at home on the mountaintop providing reliable network node service at a price lower than ever before. It remains TheNet and TNC-2 compatible, but has the power to ensure that in high speed end-to-end links data is not slipped.

The PacComm SPIRIT-2/RF incorporates the SPIRIT-2 packet controller and either a TEKK KS-2000 (3 watt, 220 MHz) or KS-1000 (5 watt, 440 MHz) commercial data transceiver in a single unit. The unit is housed in a case similar in appearance and construction to the SPIRIT-2, but of double height (2.5 inches).

The 440MHz model is available with data rates of 9600 or 19,200 baud and the 220 MHz model is available with an RF data rate of 9600. The TEKK radios are crystal controlled and have excellent turn-around times for efficient data operation.

Optional A-to-D adapter provides remote telemetry when used with TheNET network firmware. Allows remote monitoring of temperature, supply voltage, transmitted and received deviation, and received signal strength.

Since the TEKK radios are crystal controlled, allow 4-5 weeks for delivery to allow time to obtain good quality aged crystals. Baud rate and exact frequency must be specified at time of order.

SPIRIT-2 High Performance Packet Controller

The SPIRIT-2 is the ideal TNC for the modern (9600 bps & faster) packet station & for BBS, satellite and NODE use. The SPIRIT-2 is built for reliable high performance, yet is very affordable.

Uses reliable, tested technology (G3RUH modem, TNC-2 CPU architecture) with large-scale programmable logic circuits to reduce cost for solid, reliable performance.

Firmware Features

PacComm firmware uses TAPR style commands with many PacComm extensions and improvements, including KISS. Personal Message System features forwarding, reverse forwarding to other PMS & to BBS. Forwards via network connections or directly.

Digital Section Features

512kbit (64k Byte) EPROM. 128k RAM provides 64k of Personal Message System storage and large send and receive buffers. TNC-2 compatible design works with any TNC-2 EPROM.

Bank-switching circuit for TheNet or ROSE network firmware. No wiring modifications required, just set jumpers.

9.8 MHz CPU clock speed and 10 MHz rated parts are standard. 20 MHz CPU option.

Terminal baud rates from 9.6 kb up to 57.6 kb for satellite file downloads without dropped frames.

Modem Features

G3RUH design modem with PLL demodulation for outstanding performance. Two independent modem transmit and receive filter sections to allow jumper selection of either of two radio baud rates with optimum transmit and receive filtering for each. Radio baud rates from 4.8 kb up to 57.6 kb are supported for fast satellites and network node use. (64kb on special order.)

User Features

Six LEDs. Power (red), Connect (green), Status (yellow), Push to Talk (red), DCD (green) and OPT (a multi-purpose dual color LED). When used with the CoaxLAN, red and green indicate transmit and receive data on the LAN.

Black anodized aluminum case; rugged, attractive, and extensive RFI/EMI filtering.This is a quiet TNC!

Reliability Features

Radio and serial port lines extensively filtered against RF and noise effects.

Major RS-232 and radio lines and power feed are protected against power spikes with on-board surge surpressors (Transorbs).

Network Features

- TNC-2 EPROM compatible, TheNET X1, ROSE, and TEXNET ready, Processing power and modem performance for serious throughput.
- PacComm's CoaxLAN circuit is built in for easily inter-connecting multiple SPIRIT-2's for node stacks. Works with NET/ROM, TheNET, and ROSE. No more need for diode matrices!
- PAD model without modem circuitry attaches easily to WA4DSY MSK modem.

Standard Model : 128k RAM, .PacComm PMS firmware. Main modem filters configured for 9600 bps. Auxiliary modem filters are available at extra cost.

Satellite Model :128k RAM.PacComm PMS Firmware. Modem filters for 9.6 and 38.4 kbps. Other modem filter speeds available upon request.

Node Model :32k RAM. 27C512 EPROM with PacComm Diagnostic Monitor. Modem configured for 9.6 and 38.4 kbps. Other speeds upon request.

Node Model/20 MHz : 32 k 70 nanosecond RAM, Blank 27C512 70 ns EPROM. 20 MHz CPU running at 19.6 MHz. Modem filters for 9.6 and 19.2 kb. Other speeds available.

Backbone Model : 32 k 70 nanosecond RAM. 27C512 70 nanosecond EPROM with PacComm Diagnostic Monitor Program. 20 MHz CPU running 19.6 MHz. Modem filters for 38.4 and 57.6 kb.provided. Other speeds upon request.

PAD Model : Want to drive a WA4DSY (GRAPES) MSK modem? The SPIRIT-PAD is a 20 MHz Backbone model with no modems fitted. Drives the MSK modem via the auxiliary modem header.

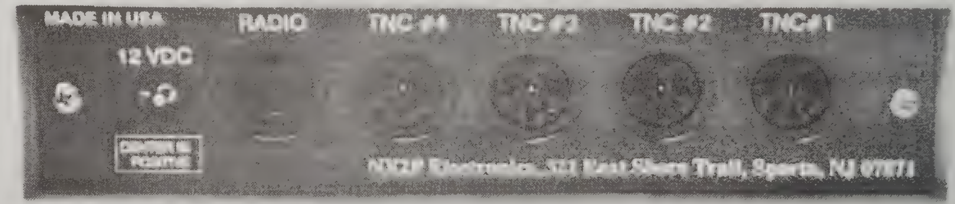
All SPIRIT-2 Models include:

- Operating Manual with 'Quick-Start section' (Standard and Satellite models).
- Hardware Manual with all schematics
- Computer cable for 9 pin PC serial port.
- Unterminated radio cable.

Radio Multiplier-II (RM-II)

The RM-II allows **maximum utilization** of the dedicated packet station. The RM-II is an ideal device for multiplexing numerous functions through a single radio. Run TCP/IP and AX.25 simultaneously through the same radio. The RM-II is a valuable tool around the shack. Use it to compare the performance of a TNC with a "known good" unit using the same radio and real-world signals.

The RM-II allows up to four TNCs to share one radio by diode "Or-ing" the PTT control signal from each TNC and combining their audio outputs. This combined audio signal is then sent to the transceiver's microphone input as well as being amplified and combined with the transceiver's receive audio before being sent to the receive audio input of each TNC. The audio feedback prevents more than one TNC from keying the radio at the same time and provides the means for all the TNCs to communicate between each other. Audio inputs are high impedance and outputs are low impedance.



The RM-II connects to the radio via a 5 pin DIN socket. Each TNC is connected to the RM-II via its own cable (not supplied) to its own connector on the rear of the RM-II. The RM-II requires a single 12V supply for operation. Unswitched 12V from the RM-II's input is available at each of the TNC connectors to supply to the TNCs.

PacComm Amateur Products Order Form

If you live outside the United States, please submit your order to the nearest dealer or distributor in your country or area. Sending your order direct to PacComm causes delivery delays. Orders placed from overseas for delivery within the USA may be sent to PacComm. All prices subject to change without notice. Dealer prices may vary.

Send this form with your check, money order, or credit card information (including expiration date) to:

PacComm Packet Radio Systems, Inc.
4413 N. Hesperides Street
Tampa, FL 33614-7618 USA

Note: Personal checks require 5-10 working days to clear before goods are shipped.

Credit card or COD orders may be placed via:

- Telephone Switchboard (813) 874-2980
- Facsimile (813) 872-8696
- BBS (813) 874-3078
- Toll Free Order Line (800) 486-7388

(When telephoning orders, be sure to have your credit card number ready!)

Name: ____________________

Address: ____________________

City, State/Province: ____________________

ZIP/Postal Code: ____________ **Country**: ____________

Telephone (circle whether Day or Evening): (Area Code) (________) ____________

Payment: COD (USA only)(COD payment must be in cash, cashier's check, or money order. NO personal checks)

CHECK MONEY ORDER Date:__________ Amount:____________

VISA MASTERCARD DISCOVER AMEX Card No: ____________

Expiration date_:__________Signature: ____________

Quantity Ordered	Product Description	Price Each	Extended Price

- Florida and Ohio residents MUST add sales tax.
- **$6.00 shipping fee** is for UPS surface within the continental U.S. If you prefer another method, circle your choice below and we will add the extra shipping charge to your total.
- **COD**-$5.00 additional charge. **You must be available to accept and pay for a COD shipment. We will bill you for shipping charges on returned COD shipments!** Payments for COD must be either in cash, cashier's check, or money order.
- Personal checks are not accepted without prior approval.

Total for Goods: ____________

Credit from prior order: ____________

Sales Tax (FL = 6 or 7%) (Ohio = 6.5%): ____________

Shipping Charges (see notes at left): ____________

Total: ____________

Shipping Instructions

Circle One

UPS Surface
UPS 2nd Day Air
UPS 3rd Day
UPS Overnight

Express Mail
Priority Mail
Parcel Post
Surface Freight

Standard Air Freight
Rush Air Freight
FedEx P1
FexEx Economy

Airborne Next Day
Airborne Economy
Other (specify)
____

PacComm Amateur Products Price List (as of May 10, 1997)

Packet and PacTOR Controllers

PicoPacket

(all models now come with Open Squelch DCD)

PicoPacket Standard Model
128k RAM $ 149

PicoPacket with Battery Pack
128k RAM $ 209

Dual Serial Port PicoPacket
2nd Serial Port, RTC, 128k RAM $ 199

Dual Serial Port PicoPacket w/Battery Pack
2nd Serial Port, RTC, 128k RAM $ 259

Spare Battery Pack $ 45

PicoPacket w/ Internal GPS Receiver
and Trimble Active Antenna $ 549

PicoPacket w/ Internal GPS, Battery Pack,
and Trimble Active Antenna $ 599

SPIRIT-2

All models include a Power Supply (US only), manual, schematic, and cables.

Standard Model $ 239
9600 primary modem filter included.

Satellite Model $ 249
9600 primary and 38400 secondary modem filters included.

SPIRIT-2/RF

SPIRIT-2 with 5-watt 440Mhz or 3 Watt 220Mhz data transceiver incorporated into a single unit. Specify 9.6 or 19.2kbps (440Mhz only) and frequency.

SPIRIT-2/RF96(440Mhz) $ 449
SPIRIT-2/RF96(220Mhz) $ 479
SPIRIT-2/RF192(440Mhz) $ 499

SPIRIT Node and Backbone Models
(see Network Products)

TINY-2 MK-II

(Now with 10 Mhz clock speed standard)

All models include Manuals, schematic, and connector kit.

TINY-2 MK-II $ 149
Options:
'Open Squelch DCD' add $ 25
Internal DFM 9600 bps modem card (MC-NB96) add $ 119

TINY-2 MK-II/GPS $ 499

TINY-2/10MHz w/internal GPS, active antenna, pwr supply, 9-9/F-F, and pigtail cable.

GPS Manual $ 40

TINY-2 Node Models

(see Network Products)

TNC-NB96

Switchable 1200/9600 TNC Power Supply (US only), Manuals, schematic, & cables $ 289

PSK-1 Packet Satellite Modem

Includes Power supply (US only), manual, schematics, radio, & telemetry cables $ 239

Satellite Combo

TNC-NB96 and PSK-1 with all cables $ 499

TNC-320 HF/VHF Controller

HF/VHF Packet Controller includes manual, schematic, and cables $ 219
Options:
'Open Squelch DCD' add $ 25
Real-time clock add $ 30

PC-320 HF/VHF Controller

Internal manual, schematic, and cables $ 209
Options:
'Open Squelch DCD' add $ 25
Dual radio cable add $ 20
Real-time clock add $ 30

PacTOR

PacTOR Controller (PacTOR, AmTOR, RTTY) includes Power Supply (US only), manual, schematic, and cables $ 259

PacTOR-II

MultiMode DSP Controller includes Power Supply (US only), manual, schematic, and cables $ 949

Call for information about packet modem options.

HandiPacket

Includes a Power Supply (US only), manuals, schematic, cables, belt clip, and Velcro™ straps $ 229

Gracilis PackeTwin

Dual port HDLC card with DMA, TTL, RS-232 or RS-423. Shipped with NOS drivers for low cost TCP/IP system.(mfg. by PacComm) $ 249

Surface Mount DFM modem for PackeTwin (also fits Kantronics DataEngine) specify model.

PT-4800 (4800bps) $ 150
PT-9600 (9600bps) $ 155
PT-19K (19.2kbps) $ 160
PT-38K (38.4kbps) $ 165
PT-56K (57.6kbps) $ 170

BayMod-9600

9600 bps modem operates from PC parallel port, w/o BayCom Software $ 99

Node Models & Network Products

Gracilis PackeTen

Powerful NOS-AX.25-NET/ROM network switch. Up to 5 ports.(mfg. by PacComm) $ 1595

Surface Mount DFM modem for PackeTen (also fits Kantronics DataEngine) specify model.

PT-4800 (4800bps) $ 150
PT-9600 (9600bps) $ 155
PT-19K (19.2kbps) $ 160
PT-38K (38.4kbps) $ 165
PT-56K (57.6kbps) $ 170

WA4DSY 56kb MSK RF Modem

28-30 Mhz RF. Requires transverter to operating frequency $ 349

SPIRIT-2/Node

9.6kbps primary filter, 19.2kbps secondary filter, Power Supply (US only), manual, blank EPROM, schematic, and cables $ 229
Options: 20 Mhz CPU add $ 50

SPIRIT-2/Backbone

20MHz CPU, 57.6 kbps primary filter, 38.4 kbps 2nd filter, Pwr Sup (US only), manual, blank EPROM, schematic, cables $ 279

SPIRIT-2 PAD

Modemless 20mhz model for WA4DSY Modem $ 239

EZ-MATRIX

Diode Matrix Kit, uses DIP diode packs, unassembled $ 35

TINY-2/NODE

Includes manual, schematic, and cable connectors (without EPROM) $ 135
Options:
'Open Squelch DCD' add $ 25
MC-NB96 Modem add $ 119

Radio Multiplier-II

Allows connecting of up to 4 packet modems to one radio. Instructions, schematic $ 149

CoaxLAN Adapter

For use with TINY-2 or MFJ TTL port. Assembled. Includes schematic. Must specify ROSE or TheNet model Quantity pricing available $ 29

TEKK Data Radios

KS-900 (450-470MHz) or **KS-900L** (430-450MHz). Up to 9.6kbps. 2 watts.

Prices are subject to change without notice. Prices do not include applicable taxes and shipping charges.

PacComm Amateur Products Price List (as of May 10, 1997)

Must specify frequency____________$ 159
Modified for 19.2kbps_____________$ 209

KS-960 (450-470MHz) or **KS-960L** (430-450MHz). Up to 9.6kbps. 2watts.
Must specify frequency____________$ 169
Modified for 19.2kbps_____________$ 219

KS-1000 (450-470MHz) or **KS-1000L** (430-450MHz). Up to 9.6kbps. 5watts.
Must specify frequency____________$ 189
Modified for 19.2kbps_____________$ 239

KS-2000 (216-222MHz) 3 watts. ___$ 219

Filters to modify KS-900/960/1000 for 19.2kbps_____________________$ 35

Maxon Data Radios

SM-2150 (148-174MHz) 4 Channel, 1-3 watts (low) 1-25 watts (high)_____$ 404

SM-2450 (440-470MHz) 4 Channel, 1-3 watts (low) 1-25 watts (high)_____$ 439

Accessories and Upgrades

SPIRIT-2 Secondary Modem Filters

Specify 4.8-57.6kbps_______________$ 9

Trimble GPS Antenna_________$ 65
Antenna supplied with SMB-Jack. Connector may have to be changed to use with other manufacturers GPS receivers.

PacketPet for Windows

Two 3.5" diskettes and manual. Must supply call sign for password generation _____$ 79

AD-4 with S Meter Function for X1J

Specify if Header model (SPIRIT-2) or 40 pin CPU plug-in model_______________$ 49

'Open Squelch DCD' Adapters

Specify model :
DCD-3105
For use with TINY-2/MICROPOWER-2
DCD-Header
TNC/PC-320, TNC-200, fits any TNC with TAPR modem disconnect header.
DCD-Universal model has wire leads for connection____________________$ 29

10 MHz Upgrade Kit

For older TINY-2, MICROPOWER-2, TNC-00, TNC-NB96, and MFJ TNCs. Includes CPU, SIO, 100ns EPROM. Specify model number and version of TNC________________$ 25

MC-NB96

Internal 9.6 kbps modem for TINY-2, TNC-200, MFJ, etc.____________$ 119

APRS Port Switch (HSP Mode Switch

Fits PC with DE-9P, and TNC & GPS with DE-9S______________________$ 29

Firmware (EPROM) & RAM Upgrade

Latest firmware____________________$ 35
Latest firmware w/APRS (no PMS) for HandiPacket and 320 Series_________$ 35
32k RAM___________________________$ 12
128k RAM__________________________$ 25

Heath Pocket Packet (HK-21) EPROM

Latest PacComm firmware, installation instructions ,EPROM, Operating Manual, Command Reference Card________$ 49

Manual Sets

Manual Set for any product EXCEPT GPS. Includes Operating/Technical Manual(s), schematic(s) supplied with product_____$ 10

Trimble SVee6-CM3 GPS Receiver Manual_____________________$ 40

Cables

Standard serial, unterminated radio, and custom radio cables are available. For custom radio cables please provide radio make and model number. Call for details and pricing information.

Commercial Service Contracts

Call for information about service contracts and/or extended warranties for amateur products used in commercial service.

Amateur units used in commercial service are not subject to any quantity discounts.

PacComm Warranty Policy

PacComm products are carefully designed, built, and test to provide good value and long service.

All amateur radio products carry a 30 day money-back guarantee to allow for the return of units that do not meet your requirements. Returned units must be in "like-new" condition or a restocking fee will be applied.

All amateur products carry a 12 month warranty. This warranty does not apply to amateur products used in commercial applications or which have been damaged by misuse or accident.

PacComm will repair or replace, at its option, any unit in warranty which is returned to the factory and found to be defective.

Repair Service

Repair service is available for units that are not within the warranty period. Repair charges are $35/hr plus parts and shipping.

Payment Options

PacComm accepts VISA®, MasterCard®, Discover™, American Express®, Diner's Club cards, and personal checks for payment. Personal checks will require 5-10 business days to clear before shipment.

Personal checks are not accepted unless arrangements have been made in advance.

COD (USA only) must be paid in cash. cashier's check, or money order.

Shipping

Orders are shipped via UPS [specify preference]:
Ground (6-8 days)________________$ 6
Orange (3 days)_________________$ 8
Blue (2 days)_________________$10
Red (overnight)_________________$16

Above pricing is based on the average one pound package.

Other shipping methods available upon request: FedEX, USPS Priority Mail or Express Mail.

COD shipments (USA only) incur a $5 COD fee.

The catalog back cover contains a photographic overview of PacComm's Intelligent Border Marker System, which was developed in conjunction with Booz-Allen Hamilton for the Department of Defense.

The system was installed in Bosnia and allowed U.S. troops to monitor the border with less manpower, as well as a higher degree of safety an security.

The systems consists of four major subsystems: a digital repeater backbone network, intelligent border markers, vehicle location units, and sensitive site markers. The system also includes base stations with custom Windows95 mapping software.

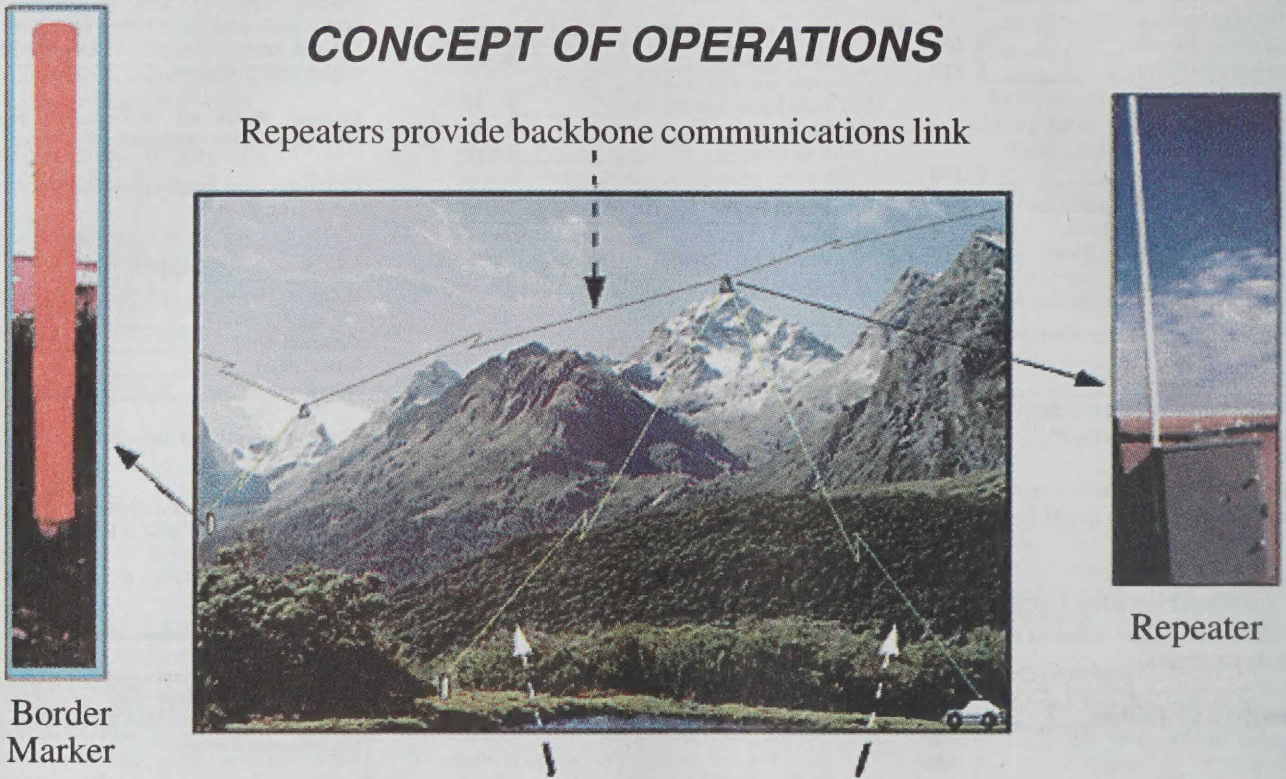
In addition to PacComm packet modems and accessories, equipment subsystems were supplied by Digital Communications, Inc., Eagle Telonics, Maxon Electronics, MaxRad, Manning NavComp, Sproul Mapping, TEKK, Inc., Transel Technologies, Trimble Navigation, and Xanthus Network Software.

Prices are subject to change without notice. Prices do not include applicable taxes and shipping charges.

PacComm *WINS* 1st Place in GPS World Applications Contest !!! Contact us for all your GPS/APRS needs.

BORDER MARKER SYSTEM

CONCEPT OF OPERATIONS



Border Marker and vehicle systems
communicate with Repeaters

PacComm Packet Radio Systems, Inc.

4413 N. Hesperides Street
Tampa, FL 33614-7618 USA

Main Switchboard: 813-874-2980
Facsimile: 813-872-8696
e-mail: sales@paccomm.com
Toll Free Order Line: 800-486-7388
Browse our on-line catalog @ http://www.paccomm.com

Please contact us for additional information on the products in this catalog and on the many additional items shown on the price sheets which are not described herein. Browse our web page regularly for the latest product information.

Communications Professionals

Contact PacComm for assistance with your **Vehicle Tracking** or other **GPS** positioning and **RF data communication** requirements. Ask for literature on our commercial and industrial products.